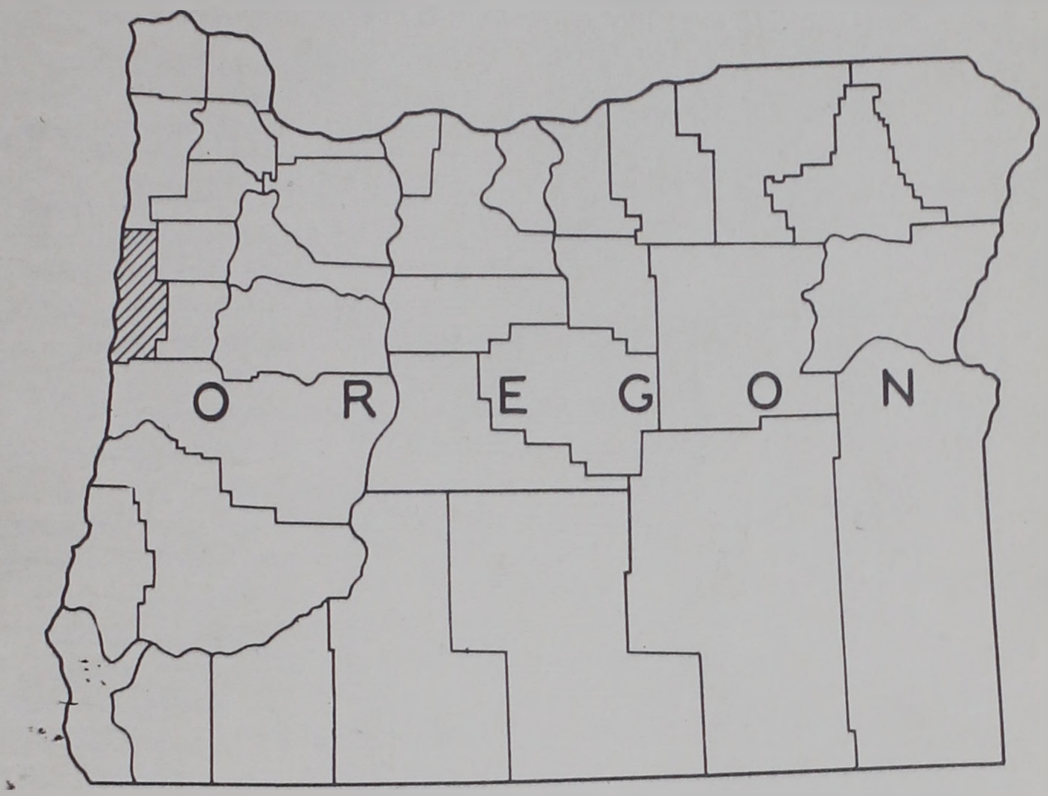
FOREST STATISTICS
FOR
LINCOLN COUNTY, OREGON

FROM THE FOREST SURVEY INVENTORY REVISED IN 1942

FOREST SURVEY REPORT NO. 93



U.S. DEPARTMENT OF AGRICULTURE FOREST SERVICE
PACIFIC NORTHWEST FOREST AND RANGE EXPERIMENT STATION
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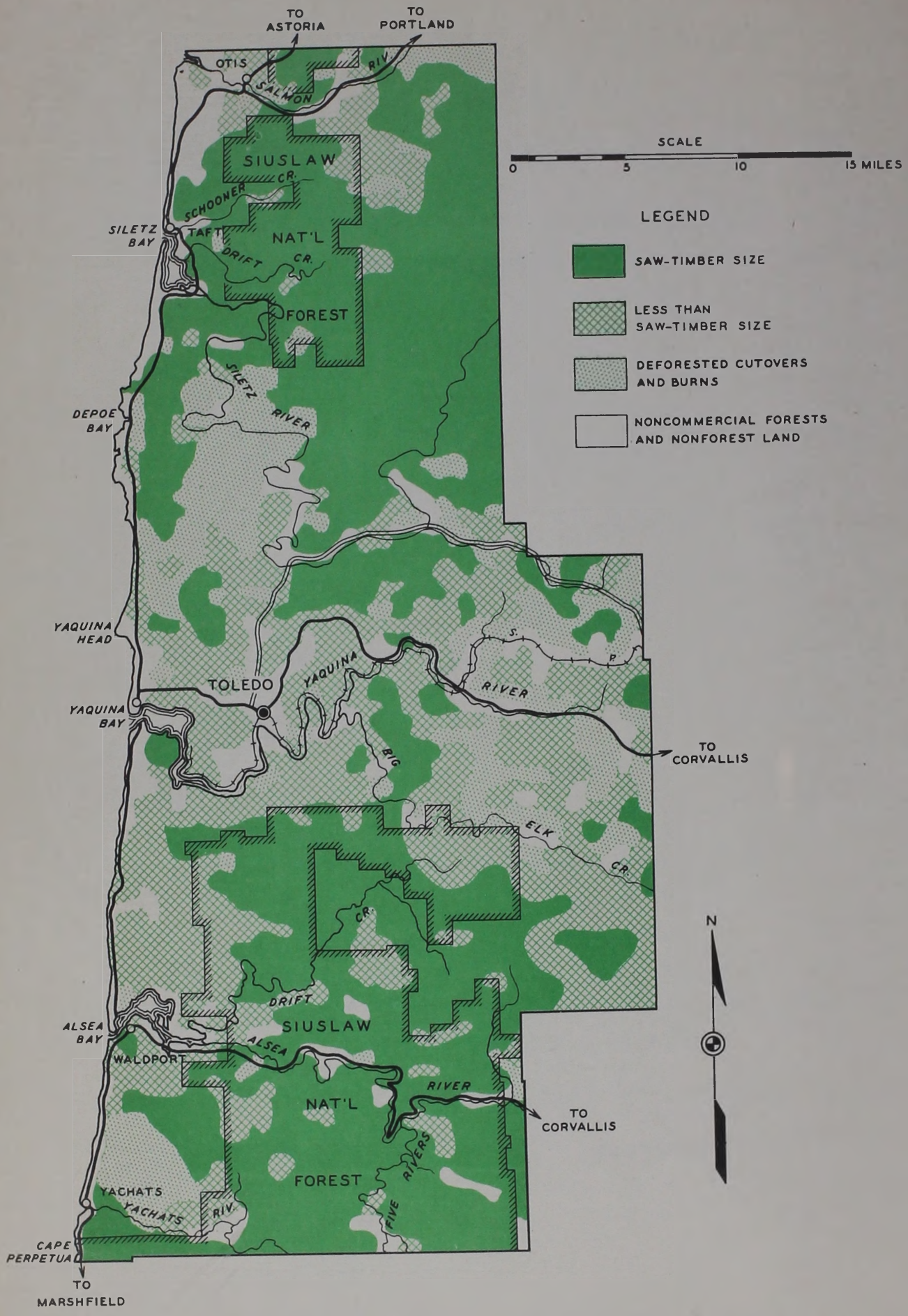
PORTLAND, OREGON MARCH 15, 1944

FIGURE 1

OUTLINE MAP OF LINCOLN COUNTY, OREGON

1942



FOREWORD

The forest survey, a Nation-wide project, consists of a detailed investigation in five major parts of present and future forest resources: (1) An inventory of the country's existing forest resources in terms of areas occupied by forest-cover types and of timber volumes, by species, in board feet and cubic feet, and a study of conditions on cut-over and on burned forest lands; (2) a study of the depletion of the forests through cutting and through loss from fire, insects, disease, and other causes; (3) a determination of the current and potential growth on forest areas; (4) an investigation of present and prospective requirements of the United States for forest products; and (5) an analysis and correlation with other economic data of findings of these studies in order to make available basic facts and guiding principles necessary to plan for sound management and use of forest resources.

The forest survey of Oregon and Washington, an activity of the Pacific Northwest Forest and Range Experiment Station, was conducted in the Douglas-fir region during the period 1930-33.[1] In 1937 work of keeping the survey up to date was commenced in counties in which there had been a large amount of cutting depletion since the original survey.

The original inventory of the forests of Lincoln County, Oregon, was conducted in 1931 and 1932, and a statistical report, summarizing the results, and a detailed forest type map were issued. In 1942 a reinventory of the county's forests was made to bring the statistical data and forest type map up to date. Revision of the data and map was based on field examination and recognized all changes in forest type acreages and timber volumes due to logging and fire, restocking of cut- and burned-over areas, and transfer of landownership since the original inventory. A very-material aid in the field work of the reinventory was the use of vertical aerial photos and topographic maps covering the major portion of the county.

Revised statistics are given in this report and prints of the revised forest type map may be obtained.[2]

1/ Oregon and Washington were divided for survey purposes into two regions: (1) Douglas-fir region, consisting of that part of both states west of the Cascade Range summit, and (2) ponderosa pine region, that part of both states east of the Cascade Range summit. A regional report which includes an interpretation of the forest survey data and analysis of the forest situation has been published for each of the two regions.

2/ For information on the detailed 1-inch-to-the-mile forest type map of the county or the 1/4-inch-to-the-mile lithographed state type maps covering Oregon and Washington, address Director, Pacific Northwest Forest and Range Experiment Station, 423 U. S. Court House, Portland 5, Oregon.

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FOREST STATISTICS FOR LINCOLN COUNTY, OREGON

By F. L. Moravets 3/

Physical factors that determine the natural vegetative growth and influence economic land use of a region are so combined over the one thousand square miles enclosed within the boundaries of Lincoln County, Oregon, as to make the area particularly well adapted to the production of forest crops. Ninety-two percent of the county's land surface is forest land. Currently, some of this forest land supports heavy stands of excellent old-growth timber, some is stocked with thriftily growing timber, and some is idle as a result of the ravages of recurrent fires; practically all is of high productive capacity--among the best in the Douglas-fir region of western Oregon and western Washington.

The manner in which these forest lands are managed will determine the extent to which their high productiveness is utilized. The first requisite of any plan for their management is a thorough knowledge of the present and potential aspects of the entire forest situation. It is believed the following analysis of data on extent and character of the forest resource, the current rate of drain upon it through cutting and the natural agencies of depletion, and the current and potential rates of its replenishment through growth will provide the basis for such an understanding.

Physical Character of County

Occupying a portion of the coastal belt of western Oregon and lying approximately between the 44th and 45th parallels of latitude, Lincoln County has a temperate climate characterized by heavy rainfall during fall and winter months, a long humid growing season, and slight temperature fluctuations.

Mean annual precipitation varies from 50 to upwards of 80 inches, the lesser quantities occurring along the coast and the greater quantities over the mountainous inland portion of the county. Only a small part of the precipitation falls as snow and that upon the higher ridges and peaks.

The topography, characteristic of the western slopes of the Coast Range in Oregon, is very broken. Along the ocean front there are in places narrow stretches of coastal plain; in other places, mountainous formations reach to the shore to end abruptly as bold headlands. Slopes leading from the shore to the crest of the Coast Range, which lies either along or shortly beyond the eastern boundary of the county, have been

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3/ Field work of the revised inventory was by P. A. Brinson and P. A. Briegleb; data compilation was by Inga E. Fulkerson, Dorothy L. Masche, G. S. Meagher, G. E. Morrill, and W. H. Schwindel.

broken into an intricate labyrinth of rounded hills and ridges and narrow winding valleys. However, there is no really steep or precipitous terrain. Several peaks, with rounded crests and entirely forested, rise above the general height of land. The highest peak, Saddleback Mountain, reaches to 3,359 feet; several others are above 2,000 feet. The stream bottoms vary from a few feet above sea level to about 400 feet; most of the ridge tops lie from 1,000 to 1,500 feet. There is very little level land in the county. In addition to the tidal flats and marine terraces along the coast, there is an occasional short and narrow stretch of bottom land along the larger streams.

The county is well drained by several short rivers and their many tributaries. All of the larger streams--the Siletz, Yaquina, Alsea, Yachats, and Salmon Rivers--have their principal headwaters near the crest of the Coast Range and flow to the ocean through sinuous courses. Each of the rivers has formed a small, shallow bay at its mouth. Through the building of jetties and channel dredging, Yaquina Bay has been made navigable for a short distance by ocean-going vessels drawing up to 18 feet of water; Siletz Bay and Alsea Bay may be entered at high tide by boats drawing up to 8 feet of water.

Soils in Lincoln County are of three broad types, depending on their geological formations: residual soils on the slopes and ridges, alluvial soils of the valley floors, and alluvial and marine deposits of the coastal plains. The residual soils, which cover the vast bulk of the county, are chiefly clay loams and constitute the forest lands. The alluvial soils of the valleys are generally sandy loams well adapted to agriculture use. The soil of the coastal plains vary from fine dune sands to sandy loams; the former are of no value for agriculture but the latter are suitable for crop or pasture land.

Topography and soil character has quite definitely limited agriculture to the alluvial soils. The forest survey found approximately 43,000 acres in agriculture use, either under cultivation or in improved pasture land. This acreage is less than 7 percent of the county's total land area. The acreage devoted to agricultural use has decreased; Bureau of the Census Statistics show that the area classified as cropland in 1939 in the county was 12 percent less than in 1929.

Resort areas, tidelands, and sand dunes along the coast total some 8,000 acres making the aggregate area of nonforest land about 51,000 acres or 8 percent of the county's area. The remaining 92 percent was classified as forest land in the forest survey.

Forest Land

Although early history of the Oregon Coast country is both meager and vague, accounts of the first white explorers and traders indicate that at the beginning of the nineteenth century the country that is now Lincoln County was an almost unbroken forest wilderness of large old-growth timber. Huge fires, some thought to have been in the early part of the century and the most devastating in 1846 or 1847, swept the coast

country from Coos Bay to Tillamook Bay. In Lincoln County only one large body of timber--some 125,000 acres in extent and including the bulk of the Siletz River drainage and the upper portion of the Salmon River drainage--escaped these early fires. Subsequent fires, occurring from time to time up to a fairly recent date and sweeping through many parts of the county, have further influenced the present forest cover. The reinventory data indicate that the wide variance in age and density of stocking found in the immature coniferous stands on 336,000 acres of burned-over land is due very largely to recurring fires that either retarded regeneration on some areas or partially damaged established stands on other areas. Many areas have probably gone through several cycles of regeneration followed by deforestation.

Utilization of the forest through cutting for commodity production, although extending over a period of more than three-quarters of a century, changed the forest cover very little until the past two and a half decades. Although only a relatively small acreage of forest land has been converted to farm land, many of the recurring fires that destroyed immature stands and kept other lands in a denuded condition were the result of careless land-clearing operations and futile attempts to convert deforested areas into grazing land, as is so profoundly illustrated by some 40,000 acres of hill land in the east-central portion of the county, at present clad with only a dense growth of bracken fern.

The classification of the 587,000 acres of forest land in the county by forest-cover types is shown in table 1.

Conifers of Saw-timber Size

The generalized forest type map in figure 1, inside the front cover, shows two large bodies of saw timber--one extending northward from the divide between the Yaquina and Siletz Rivers to about the Salmon River, and the other stretching southward from Big Elk Creek to the county's southern boundary. The northern body contains practically all of the remaining old-growth timber and, in addition, some 30,000 acres of immature timber of saw-timber size (about 20 inches, diameter breast height, and larger). The southern body is very largely immature Douglas-fir from 80 to 90 years old; exceptions are a few thousand acres of old-growth Sitka spruce and western hemlock in the lower Yachats River drainage and an occasional small island of old-growth fir a few miles inland.

In table 2, which combines the detailed forest cover types into generalized groups, it is seen that the area of conifer saw timber totals 308,000 acres, about 52 percent of all forest land. On 82 percent of this saw-timber acreage Douglas-fir comprises three-fifths or more of the merchantable volume; western hemlock is the major species on 13 percent and Sitka spruce on 4 percent; on relatively small acreages either Pacific silver fir, noble fir, or western redcedar is the key species in the stand.

Saw-timber stands predominantly Douglas-fir are of three general age and size groups: large old growth more than 40 inches d.b.h. and averaging 400 years old, small old growth from 22 to 40 inches d.b.h. and about

Table 1.--Area, in acres, of all forest cover types, by ownership class

Data corrected to September 1, 1942

Type No.	Type	Private	State		County	Municipal	Indian	Federal, Available			Total
			Available	Reserved 1/				Revested land grant	Public domain	National forest	
	Douglas-fir										
6	Large old growth	50,205	60	35	2,195		1,475	155	480	4,560	59,165
7	Small old growth	2,075		15	5				10		2,105
8	Large second growth	55,095	3,620		18,060	95	2,545	3,830	6,205	102,215	191,665
9	Small second growth	53,280	9,895		24,945	460	1,265	7,365	4,180	19,435	120,825
10	Seedlings and saplings	8,175	540		2,175		215	970	545	4,860	17,480
	Sitka spruce										
11	Large	8,070	95	35	1,325	115	120		55	1,640	11,455
12	Small	6,565	130	40	1,620		40		175	490	9,060
13	Seedlings and saplings	3,345			500	105				270	4,220
	Western hemlock										
14	Large	25,830	85	5	3,170		1,045		1,835	8,005	39,975
15	Small	2,115		5	1,045				1,000	345	4,510
16	Seedlings and saplings	875			50				10		935
17	Western redcedar, large	785			195		300		5		1,285
23	Fir-mountain hemlock, large	1,800			190				70		2,060
	Lodgepole pine										
25	Large	120								5	120
26	Small	4,730	15	60	405						5,215
	Hardwood										
31.5	Large	2,765	55		615		35		655	6,045	10,170
31	Small	9,895	1,260		3,950	15	125		395	3,165	18,805
	Nonrestocked cutover										
35	Cut prior to 1920	400									400
35A	Cut from 1920-29, incl.	7,205	5		120		35		30	5,805	13,200
36	Recent cutover, since 1930	27,765	115	405	460	60	100	35	10	2,700	31,650
37	Deforested burn	21,460	5,935		8,310	30	690	1,055	2,515	2,225	42,220
	Total forest types	292,555	21,810	600	69,335	880	7,990	13,410	18,175	161,765	586,520
	Nonforest land										
3	In agricultural use	36,735	935	10	1,005	30	1,295	10	50	2,665	42,735
2	Other	7,740	85	95	470		5		25	205	8,625
	Total	337,030	22,830	705	70,810	910	9,290	13,420	18,250	164,635	637,880

1/ Includes 75 acres in lighthouse reservation.

Table 2.--Area, in acres, of generalized forest types, by ownership class

Data corrected to September 1, 1942

Type definition	Private	State		County	Municipal	Indian	Federal, Available			Total
		Available	Reserved 1/				Revested land grant	Public domain	National forest	
Conifer saw timber Types 6, 7, 8, 11, 14, 17, & 23	143,860	3,860	90	25,140	210	5,485	3,985	8,660	116,420	307,710
Conifer second growth Types 9, 12, & 15										
On cut-over areas	3,155	420		1,250	40	125		40		5,030
On old burns	58,805	9,605	45	26,360	420	1,180	7,365	5,315	20,270	129,365
Total	61,960	10,025	45	27,610	460	1,305	7,365	5,355	20,270	134,395
Conifer seedlings & saplings Types 10, 13, & 16										
On cut-over areas	7,345			430		110			270	8,155
On old burns	5,050	540		2,295	105	105	970	555	4,860	14,480
Total	12,395	540		2,725	105	215	970	555	5,130	22,635
Recent cut-over areas Type 36	27,765	115	405	460	60	100	35	10	2,700	31,650
Nonrestocked cut-over and burned-over areas Types 35, 35A, and 37	29,065	5,940		8,430	30	725	1,055	2,545	8,030	55,820
Hardwoods Types 31 and 31.5	12,660	1,315		4,565	15	160		1,050	9,210	28,975
Noncommercial areas Types 25 and 26	4,850	15	60	405					5	5,335
Total forest types	292,555	21,810	600	69,335	880	7,990	13,410	18,175	161,765	586,520
Nonforest land Types 2 and 3	44,475	1,020	105	1,475	30	1,300	10	75	2,870	51,360
Total	337,030	22,830	705	70,810	910	9,290	13,420	18,250	164,635	637,880

1/ Includes 75 acres in lighthouse reservation.

200 years old, and thriftily growing timber 22 to 40 inches d.b.h. and varying from 50 to 160 years old, but the majority of which is between 70 and 90 years of age.

The large old-growth fir in Lincoln, County, is a very high-quality timber, comparing very favorably with any fir found in either western Oregon or western Washington. The average gross volume of the stands is approximately 100,000 board feet per acre and in size the timber varies from 40 to 100 inches d.b.h. and 9 to 14 logs in length. Of the 59,000 acres remaining, some 47,000 acres is in one solid body in the Siletz River drainage. This highly desirable tract of fir, long remote from transportation facilities, has been opened up at several points in the past few years and is now being rapidly harvested. Other bodies of large old-growth fir are small in extent, some of them islands of 50 to 500 acres that escaped the severe fires of the past century. Western hemlock is a common associate in most of the old-growth fir stands and generally comprises about 15 percent of the total volume; Sitka spruce is also a common component in stands nearer the coast; and western red-cedar comprises a very small part of the volume.

The small old-growth fir stands are of relatively little importance here as they cover but 2,000 acres, this area being composed of several tracts of limited extent.

Stands of immature fir of saw-timber size constitute one of the county's most valuable forest assets. They cover 193,000 acres, or 32 percent of the total forest land, and occur generally in large tracts. It is probable that practically all of this acreage was deforested by the large fires that occurred about the middle of the past century. In the northern portion of the county there is one nearly solid body of this class of timber of about 25,000 acres in the drainages of Schooner and Drift Creeks. Stands in this body are well stocked with trees about 80 years old. In the southern portion there is a tract of this type of about 125,000 acres lying between Big Elk Creek and Yachats River. It is unbroken except for stringers of red alder along valley bottoms and an occasional small area of Douglas-fir of a younger age class. In general, the stands making up this large tract are 70 to 90 years old and fairly well stocked. They usually contain an understory of red alder which comprises on the average about a fourth of the stocking. Fortunately there has been only a small amount of cutting in these immature fir stands in the county in the past. Most of the stands are approaching the period of maximum volume increment and should be allowed to more fully mature.

Saw-timber stands dominated by hemlock are located principally in three locations: in the upper Salmon River drainage on the slopes of Saddleback Mountain, in the vicinity of Siletz Bay near the coast and reaching inland some 8 to 10 miles, and in the lower drainage of the Yachats River. Stands covering the 40,000 acres of this type average about 40,000 board feet per acre and usually contain associated species--an appreciable percentage of spruce and small amount of fir near the coast, and noble fir or Pacific silver fir on the higher mountain sites.

The hemlock is generally of very good quality, averages from 26 to 32 inches d.b.h. and 6 logs in length, and is suitable for pulp or lumber. Cutting of stands largely hemlock has been light to date.

Stands in which Sitka spruce dominated were among the first in the county to be harvested by fairly large-scale operations. During World War I, when this species was in demand for aircraft material, a few areas of this type near the coast were opened up. Subsequently considerable quantities were cut for box and creamery package material and for lumber. During the present war, remaining stands have been searched for high grade logs for aircraft lumber. Remaining stands of this type cover about 11,000 acres in relatively small bodies near the coast. Greatest concentration is in the vicinity of Yachats River and Depoe Bay.

The few stands of small extent in which Pacific silver fir or noble fir is in majority are on the slopes of Saddleback Mountain.

Conifers Less than Saw-timber Size

In addition to the large acreage of immature conifer saw timber in the county there is a total of 157,000 acres stocked with conifers of seedling and sapling size (0 to 6 inches d.b.h.) and pole size (6 to 20 inches d.b.h.). These young stands are grouped in table 3 by type, age class, and degree of stocking.

The influence of fire upon the present forest cover is clearly shown by the fact that 92 percent of the acreage now stocked by these immature conifers was deforested burns and only 8 percent was cut-over land.

Stands in which Douglas-fir is predominant cover 88 percent of the immature acreage. Those of pole size vary from 20 to 70 years old but on nearly half of this type's acreage they are in the 50-year age class, and on practically all of the remainder they are either in the 40- or 60-year class. Greatest concentration of these fir pole stands is in the drainage of the Yaquina River; in the lower portion there are fairly broad areas of unbroken type composed of a number of individual stands of varying age class and degree of stocking; in the upper portion the pole stands are interspersed with deforested areas and red alder types. The acreage of seedling and sapling fir stands is comprised of numerous small areas, most of which are interspersed among areas stocked with pole stands. A little over a fourth of the acreage was cut-over land.

Table 3 shows the fir pole stands to be fairly well stocked and those of seedling and sapling size to be fairly poor in stocking. However, many of the pole stands contain red alder in considerable amounts while the younger stands contain only a small percentage of alder. Disregarding the alder composition, the pole stands have a weighted average stocking of 47 percent of full stocking and the seedling and sapling stands, 46 percent.

Immature conifer stands in which either Sitka spruce or western hemlock dominate stock small scattered tracts most of which were burned-over land. Alder is an associate in some of them but in general they are of nearly pure conifer composition. Pole-size hemlock stands have a weighted

Table 3.--Area, in acres, of certain immature conifer types by age class and degree of stocking

Data corrected to September 1, 1942

Age class (years)	Degree of stocking	Type number and name: 10 Douglas-fir seedlings and saplings	9 Douglas-fir small second growth	13 Sitka spruce seedlings and saplings	12 Sitka spruce small second growth	16 Western hemlock seedlings and saplings	15 Western hemlock small second growth	Total
10	Good	505						505
	Medium	6,625		1,010		560		8,195
	Poor	6,505	90	1,380		295		8,270
	Total	13,635	90	2,390		855		16,970
20	Good	1,095	55					1,150
	Medium	2,615	275	455	110		130	3,585
	Poor	105				80		185
	Total	3,815	330	455	110	80	130	4,920
30	Good		4,000	90	1,400		250	5,740
	Medium	30	1,680	1,105				2,815
	Poor							
	Total	30	5,680	1,195	1,400		250	8,555
40	Good		22,455		4,415		1,790	28,660
	Medium		13,220	50	1,020			14,290
	Poor		280	115				395
	Total		35,955	165	5,435		1,790	43,345
50	Good		39,865		1,485		275	41,625
	Medium		15,890	15			85	15,990
	Poor		800		10			810
	Total		56,555	15	1,495		360	58,425
60	Good		14,855		95			14,950
	Medium		6,700		35			6,735
	Poor		85					85
	Total		21,640		130			21,770
70	Good		180		320		1,715	2,215
	Medium		170		115			285
	Poor		225					225
	Total		575		435		1,715	2,725
90	Good						265	265
	Medium				55			55
	Poor							
	Total				55		265	320
Total all ages	Good	1,600	81,410	90	7,715		4,295	95,110
	Medium	9,270	37,935	2,635	1,335	560	215	51,950
	Poor	6,610	1,480	1,495	10	375		9,970
	Total	17,480	120,825	4,220	9,060	935	4,510	157,030

average conifer stocking of 83 percent; spruce stands of this size class average 64 percent. The spruce seedling and sapling stands average 45 percent and the hemlock stands 43 percent.

Hardwoods

Red alder occurs throughout Lincoln County, Oregon, and finds a favorable habitat on the alluvial soils of the valley bottoms and for a short distance up the slopes. The survey found pure alder stands on some 29 thousand acres; on about two-thirds of this area the timber is of merchantable size (12 inches d.b.h. and larger). In addition, alder was found as a component of immature mixed conifer-hardwood stands covering 250,000 acres. In these stands, which cover the moist, fertile lower slopes and benches, alder comprises from 10 to 70 percent of the stocking but on most of the acreage it is the minor component. In the reinventory, all of these mixed stands were classified as conifer type since it was assumed that the conifer species will ultimately dominate the stand and constitutes the greater timber value.

On the middle and upper slopes throughout some of the higher portions of the county but particularly in the east-central portion, alder has formed a temporary forest cover that has gradually reclaimed some of the deforested acreage. Being a prolific bearer of light seed, widely disseminated by wind, this species has established itself on the lower slopes of the deforested hills and, through its abundant and easily decomposed leaf litter, has improved the impoverished soil. Later these alder stands form a nurse crop for the infiltering Douglas-fir seedlings. On the drier slopes alder makes a rather limby and stunted growth, persists for a number of years and then gradually dies.

Bigleaf maple, the only other hardwood species that attains merchantable size and quality in the county, occurs chiefly as an understory tree in some of the conifer stands.

Deforested Lands

The nonrestocked forest land in the county, of which there is currently 87,000 acres, was classified in the reinventory as: areas clear cut prior to 1930, areas clear cut since January 1, 1930, and areas on which the original stand was killed by fire.

A total of 13,000 acres of clear-cut land, logged prior to 1930, was found nonrestocked. About half of this acreage is in one solid tract along the coast just north of Yachats. Records show the tract to have been logged in the early 1920's, to have become partially stocked during the next few years but to have been completely denuded by fire in the fall of 1936. Absence of seed trees will keep this area from restocking naturally within a reasonable period. Most of the remainder of the acreage in this category is in the Siletz River drainage in several individual tracts.

The recent clear-cut areas, cut since January 1, 1930, total about 32,000 acres. Since only a relatively few years had elapsed since most of this land had been cut over, no examination to determine regeneration was made. The bulk of the acreage is in one continuous tract along the Siletz River and southward towards Newport.

Some 42,000 acres, most of which was completely deforested by the succession of early fires, has been prevented from restocking by subsequent fires. The major portion of this acreage is in the upper drainages of the Yaquina and Siletz Rivers and consists generally of the middle and upper slopes and rounded ridge crests of the rough hill land of this part of the county. A dense growth of bracken fern now covers practically all of this deforested area. During the several decades following the major fires, stands of Douglas-fir have become established in some of the draws and along the lower slopes of these hill lands. Seed from these stringers of immature fir offer the only possibility of natural conifer regeneration of the denuded areas. Because of the limited extent of the established stands and their location at the foot of slopes, necessitating uphill seeding, such regeneration will be progressive and exceedingly slow. The establishment of seeding strips along the ridge crests and upper slopes through artificial planting should be the best solution short of complete planting, which is both difficult and costly because of the heavy fern cover. Any form of reclamation of these burns, either natural or artificial, will require effective protection from fire.

Lodgepole Pine

Lodgepole pine occurs along the coast in Lincoln County where it forms both dense and sparse stands near the shore line. On these windswept and sterile sites the species seldom attains good development but is usually a rather tall, spindling growth in dense stands that are short lived and a gnarled, twisted growth in sparse stands. Few trees attain a diameter of 12 inches at breast height; on practically all of the 5,000 acres mapped as lodgepole pine type, the trees were well under this diameter.

Of no importance for timber products, other than fuelwood, this species is of considerable value otherwise. It is especially valuable for holding the drifting sand dunes and for gradually reclaiming the established sterile dune areas. Because of their stunted and gnarled growth, the pine stands and particularly the solitary trees are a picturesque part of the coast scenery.

Productive Capacity of Forest Land

The forest lands of Lincoln County are among the most productive lands in the Douglas-fir region of western Oregon and western Washington. Here physical conditions that influence tree growth are so combined as to produce favorable forest habitats throughout practically all of the county except immediately adjacent to the coast.

In the survey all forest lands occupied by conifer stands, except those occupied by lodgepole pine, and those currently in a deforested status but considered to be potential conifer land were rated on capacity to grow either Douglas-fir or Sitka spruce and western hemlock. Choice of which classification to use in the rating was based on current occupancy or, in the case of deforested lands, on the most recent occupancy. Results of this rating are given in table 4.

Table 4.--Land areas, forest land areas, and commercial conifer areas by site quality class 1/

Data corrected to September 1, 1942

Kind of forest land and site quality class	Total area		Area in forest land	Area in commercial conifers
	Acres	Percent	Percent	Percent
Commercial conifer				
Douglas-fir				
Class I	25,530	4.0	4.3	4.6
Class II	329,572	51.7	56.2	59.7
Class III	108,619	17.0	18.5	19.7
Class IV	464	0.1	0.1	0.1
Total	464,185	72.8	79.1	84.1
Spruce-hemlock				
Class I	1,408	0.2	0.3	0.3
Class II	34,310	5.4	5.8	6.2
Class III	42,052	6.6	7.2	7.6
Class IV	10,205	1.6	1.7	1.8
Total	87,975	13.8	15.0	15.9
Total commercial conifer	552,160	86.6	94.1	100.0
Lodgepole pine	5,335	0.8	0.9	
Hardwood	29,025	4.6	5.0	
Total other	34,360	5.4	5.9	
All forest land	586,520	92.0	100.0	
Nonforest land	51,360	8.0		
Grand Total	637,880	100.0		

1/ The "site quality" of a forest area is its relative productive capacity, determined by climate, soil, topographic, and other factors. The index of site quality is the average height of the dominant stand at the age of 100 years. Five site quality classes are recognized for both Douglas-fir and spruce-hemlock types, class I being the highest. In the survey the Douglas-fir classification was used for Douglas-fir and western redcedar types; the spruce-hemlock classification was used for western hemlock, Sitka spruce, and fir-mountain hemlock types.

Lands rated by the Douglas-fir classification, a total of 464,000 acres, average particularly high in productivity. Approximately 77 percent of the fir acreage was found to be in the upper two classes of a five-class rating and practically all of the remainder was in the third or median class. In comparison, only about 31 percent of the forest land of the entire Douglas-fir region as a whole is in the two upper classes.

Lands rated by the spruce-hemlock classification averaged appreciably lower in productivity than did those rated on capacity to grow Douglas-fir; some 40 percent of the 88,000 acres of spruce-hemlock land was in the two upper classes. A considerable portion of the spruce land fronts on the ocean and conditions here are less favorable due to exposure to strong salt-laden winds and a soil mantle built chiefly of marine deposits.

The data on productive capacity were used in computing the volume of immature stands, in estimating their current annual growth rate, and in estimating the potential growth capacity of the county's forest land.

Volume of Merchantable Timber

The reinventory showed the merchantable timber volume in the forests of Lincoln County to be 11,728 million board feet, log scale, Scribner rule. This volume is contained in conifer trees 15.1 inches d.b.h. and larger, and in hardwood trees 11.1 inches d.b.h. and larger. Distribution of the volume by species and ownership class is given in table 5.

More than four-fifths of the volume is Douglas-fir. Old-growth fir totals 3,099 million feet, nearly all of which is large-size timber of good to excellent quality; 6,354 million feet is second-growth fir chiefly in rapidly growing stands 70 to 90 years old.

Slightly more than a tenth of the volume is western hemlock, the bulk of which is of good quality. The volume of Sitka spruce and western hemlock, other major species in the county, totals 470 and 228 million feet, respectively.

Of the 131 million feet of red alder in the county, less than a third is in pure alder stands and the remainder is in the mixed conifer-alder stands. All of the small amount of bigleaf maple is in occasional trees in the understory of the older conifer stands.

Forest Ownership

A complex pattern of forest ownership prevails throughout nearly all parts of Lincoln County and this complexity applies equally well to the two broad classes of ownership--private and public. Practically every concentration of private holdings of an appreciable extent is comprised of a number of separately owned tracts; likewise, the larger concentrations on publicly held lands are usually comprised of tracts owned by two or more governmental units, some in a checkerboard pattern. The only remaining large solid body of old-growth timber, a 50,000-acre tract of large Douglas-fir, was held by some 20 owners prior to recent consolidations

Table 5.--Volume of timber by species and ownership class
Data corrected to September 1, 1942
Trees 16 inches and more d.b.h.1/

Thousands of board feet, log scale, Scribner rule

Species	Private	State		County	Municipal	Indian	Federal, Available			Total
		Available	Reserved				Revested land grant	Public domain	National forest	
Douglas-fir										
Large old growth	2,507,690	3,912	2,043	59,554		32,133	5,108	14,817	212,433	2,837,690
Small old growth	242,785	191	724	3,359		1,562	248	1,936	10,329	261,134
Large second growth	1,659,194	48,168	11	458,856	2,271	66,274	128,967	176,439	3,417,965	5,958,145
Small second growth	122,501	21,522	12	61,308	904	6,849	48,852	14,553	118,946	395,447
Sitka spruce										
Large	292,296	476	1,000	25,918	1,708	3,771		1,551	70,594	397,314
Small	43,523	679	328	15,504	17	83		1,383	11,231	72,748
Western hemlock										
Large	789,006	1,156	527	50,070		12,028		17,214	183,641	1,053,642
Small	102,361	61	134	18,232		3,230		19,003	54,890	197,911
Western redcedar										
Live	199,310	120	65	7,421		6,110		1,485	13,192	227,703
Dead	475			75						550
Western white pine	185									185
Lodgepole pine	48									48
Pacific silver fir	118,654			7,828				4,569		131,051
Grand fir	861			257				911		2,029
Noble fir	54,237			3,247				120		57,604
Red alder	28,333	2,330	1	8,053	72	229	1,435	4,436	86,432	131,321
Bigleaf maple	1,559	81		89	1	60	1	25	1,238	3,054
Total	6,163,018	78,696	4,845	719,771	4,973	132,329	184,611	258,442	4,180,891	11,727,576

1/ Trees of hardwood species taken from 12 inches and more d.b.h.

that have been effected to facilitate exploitation; individual ownerships were thoroughly intermingled and no single owner held more than 2,000 acres of contiguous timber. The largest public forest unit in the county, the federally owned Siuslaw National Forest, contains many alienations interspersed with the national forest lands; of the 239,000 acres within the boundaries of the forest, 69 percent is national-forest land, 29 percent is private and county land, and the remaining 2 percent is in State or other classes of Federal ownership.

Private

In the aggregate, individuals and corporations own half of the forest land acreage in Lincoln County. While they own a slightly smaller portion--47 percent--of the acreage of saw timber, they own 53 percent of the merchantable saw-timber volume. The general superiority of the private saw-timber stands is further disclosed by the fact that private holdings contain 85 percent of the acreage and 89 percent of the volume of old-growth Douglas-fir. About 47 percent of the area of immature conifers less than saw-timber size is in private ownership.

Practically all of the logging in the county in the past has been on private lands and most of the recent cut-over land--88 percent--is still privately held. About half of the area of nonrestocked burns and older cutovers is currently in private ownership.

During the decade between the original and revised inventories, the area of forest land privately owned was reduced 51,000 acres--about 15 percent. The major portion of this acreage passed to county ownership through forfeiture for nonpayment of taxes.

County

As of September 1942 the county owned 69,000 acres of forest land--12 percent of the total. Included in this acreage, which was 50 percent larger than the forest area in county ownership in January 1933, was 48,000 acres of immature timber, nearly 5,000 acres of hardwood stands, and about 9,000 acres of deforested lands. Rather strangely there was about 7,000 acres of old-growth timber. These old-growth stands together with the immature stands of saw-timber size contain a merchantable volume of 720 million board feet.

State

Forest land in the county owned by the State of Oregon totals 22,000 acres of which about 16,000 acres has been acquired since 1932. These additional lands were received from the county which had obtained them through tax foreclosure. Half of the State's forest land is stocked with immature conifers very largely of pole size. Only a small percentage of the near 4,000 acres of saw timber is old growth.

Six hundred acres of the State's forest area is reserved as parks.

Federal

The Federal government owns 193,000 acres of forest land and 4,624 million board feet of timber in Lincoln County, roughly a third of the total forest area and two-fifths of the total timber volume.

Of the 129,000 acres of saw-timber stands in Federal ownership, only about 17,000 acres is covered with old growth; the remaining 112,000 acres is covered with thrifty immature Douglas-fir chiefly 70 to 90 years old. Immature timber less than saw-timber size covers an additional 40,000 acres of Federal lands.

Eighty-four percent of the Federally owned forest land is national forest land in the Siuslaw National Forest, 9 percent is unappropriated public domain, and 7 percent is revested Oregon and California Railroad grant land.

Other Ownerships

Indian-owned forest land totals 8,000 acres, part of which is tribal land held in trust and administered by the Federal government and part is comprised of Indian trust allotments. The major portion of the Indian acreage is in the Siletz River drainage, and consists of remnants of the original Siletz Indian Reservations.

Municipally owned forest land, held for the protection of domestic water supplies, totals 880 acres.

Forest Utilization

Prior to the early 1920's utilization of the forest resource in Lincoln County was limited very largely to supplying local demands for rough lumber, shingles, piling, fence posts, and fuelwood; small amounts of lumber were shipped at times from Yaquina Bay to California markets in coastal schooners.

During World War I the demand for Sitka spruce for aircraft lumber focused attention on the spruce stands in the county and caused the Federal government, through the Spruce Production Division, to start a fairly large operation. This operation, which involved the purchase of a large tract of timber, principally spruce, construction of a railroad south from Newport and paralleling the coast, and a sawmill at Toledo, was acquired a few years later by a private corporation which has expanded the mill until it is now one of the larger plants in the State. Other fairly large-scale logging operations began in the late 1920's chiefly in the lower Siletz River drainage. However, greatest expansion of logging activity has come since 1938 as a result of, first, the development and wide use of truck transportation of logs which made feasible the opening up of large tracts of old-growth fir in the drainage of the Siletz and Salmon Rivers and, secondly, the war-created market for lumber and other products.

Statistics on sawlog production compiled by the Forest Service since 1924 indicate the trend of logging activity. During the period 1925-29 the average annual cut of logs was 145 million board feet. During the next five years, 1930-34, when depressed economic conditions prevailed, the average annual cut dropped to 67 million feet. The next half decade, 1935-39, saw a gradual increase in all but one year, 1938, and average production equaled that of the late 1920's--145 million feet. The broad expansion of logging operations in the last few years is indicated by an average annual cut of 270 million feet during the 3 years, 1940-42, and a peak production of 316 million feet in 1942. Douglas-fir comprised 66 percent of the total volume of sawlogs cut in the county in the 18 years, 1925-42, 25 percent was Sitka spruce, and nearly all of the remainder was western hemlock and western redcedar. Production of hardwood sawlogs during the 18-year period averaged only about a quarter of a million board feet annually. Several years during the period no hardwood logs were reported cut. The largest cut was in 1942 when a total of about 2 million board feet of logs, chiefly red alder, was cut to supply expanding alder sawmilling operations in the county. Increased utilization of alder will probably come with the harvesting of the large acreage of mixed conifer-hardwood stands which contain about two-thirds of the present alder volume.

Lack of adequate transportation facilities--deep-water harbors for transoceanic shipping and a direct transcontinental rail outlet--has hindered the development of wood-utilizing industries in the county commensurate with volume of sawlog production. There is one large sawmill, some twenty or more portable or semiportable sawmills of small capacity, one plant manufacturing creamery tubs, but no plywood or pulpwood plants. The large sawmill, located at Toledo and provided a water outlet for coastal shipping through Yaquina Bay and a rail connection with the Southern Pacific through a subsidiary, the Corvallis and Eastern Railroad, has a rated 8-hour capacity of about 400 thousand board feet, and facilities for the complete manufacture of lumber and for the further remanufacture of numerous wooden products. It is estimated that the 21 sawmills that operated in the county in 1942 consumed about 60 percent of the 316 million board feet of sawlogs produced during the year. The remaining 40 percent was exported principally by truck to forest industries in neighboring counties.

No information on the volume of forest products other than sawlogs cut annually in the county in recent years is available. A survey made in 1930[4/] showed that a total of 7 million board feet was cut annually from trees of saw-timber size in the form of pulp and fuel cordwood and fence posts, and 1 million cubic feet from trees less than saw-timber size as pulp and fuel cordwood, piling and poles, and fence posts. These volumes are probably a fair measure of current production of minor products.

4/ Johnson, Herman M. The production and consumption of minor timber products in Oregon and Washington. Pacific Northwest Forest and Range Experiment Station. 1931. Office report.

Bureau of the Census statistics for 1940 showed a total of 1,604 persons directly employed in the forest industries, 32 percent of all workers in the county; in comparison the second leading industry, agriculture, employed 13 percent of the workers.

Another form of forest utilization that is of significant importance, although an intangible value difficult to fully appraise, is the part the forests have in making the county one of the more important recreational areas of the State. Although the beaches, rugged coast line, bays, and streams are the chief recreational assets, the forests along the coast add immeasurably to the scenic beauty and, in addition, retard the movement of sand dunes that threaten resort and highway developments. Inland the forests provide a habitat for the game animals and other wildlife and influence the flow of the many streams, thereby enhancing their value for sport and commercial fishing.

Forest Depletion

Drain on the forest resource resulting from cutting of timber for commodity production and the killing of merchantable timber by fire is fairly easy to evaluate; that resulting from destruction of immature timber and deterioration of forest sites through fire and damage to stands of all ages through forest insects and diseases and wind throw is difficult to estimate.

On the basis of sawlog production statistics for a recent 3-year period, 1940-42, and an estimate of production of minor products, drain due to cutting depletion can be placed at about 277 million board feet yearly.

Records show no loss of merchantable timber through fire during this same 3-year period and relatively small damage to immature timber. Fires that have occurred during the regular season have been held to a small acreage in recent years, pre-season fires that were set in land-clearing operations or to burn fern patches have covered a much larger acreage and caused a great deal more damage.

No abnormal loss resulting from catastrophies, wind storms, insect or disease epidemics have occurred recently in the county. Loss resulting from the occasional throwing of trees by wind and endemic activities of insects and disease is considered as part of the normal mortality and is allowed for in compiling growth estimates.

Forest Growth

Determination of the rate at which the timber volume is being replenished through growth was a phase of the forest survey. Data obtained in the reinventory, on area, age, and stocking of the growing stands and productive capacity of the land occupied by them, were used in determining this rate. It was assumed that the growing stands were those under about 160 years of age; net growth in older stands is thought to be offset by mortality and decay. Board-foot growth in conifers was compiled for trees

15.1 inches d.b.h. and larger, and in hardwoods for trees 11.1 inches d.b.h. and larger. Cubic-foot growth in all species was computed for trees 5.1 inches d.b.h. and larger. The current annual net growth as of 1942 is shown in table 6 by forest type group, both in cubic feet and board feet.

Table 6.--Current annual net growth, by forest type group, 1942

Type Group	Area of growing stands	Current annual growth	
	Thousands of acres	Millions of cubic feet	Millions of board feet
Conifer			
Douglas-fir	330	31	184
Sitka spruce	15	2	4
Western hemlock	8	2	9
Total	353	35	197
Hardwood	278[1/]	2	15
Total all types	631	37	212

1/ Includes 29 thousand acres of hardwood type and 249 thousand acres of mixed conifer-hardwood type.

Four-fifths of the board-foot and three-fifths of the cubic-foot growth in Douglas-fir is being added by the 192,000 acres of large second-growth timber, type 8. On a very large part of this acreage the stands are at or near the age of greatest volume increment; the average annual growth rate for the type was calculated to be 773 board feet per acre. The immature hemlock stands also have a high board-foot growth rate but area of the stands is small.

Another kind of forest growth--potential annual growth, which is the average annual growth that could be obtained on all of the county's conifer forest land if it were stocked with growing stands averaging 75 percent of full stocking and equally distributed among the age classes up to rotation--was calculated. The average annual potential growth on Douglas-fir sites was calculated at 215 million board feet and on spruce-hemlock sites at 53 million board feet--a total on all conifer lands of 268 million board feet. Cubic-foot potential growth on Douglas-fir sites was calculated at 60 million feet and on spruce-hemlock sites at 12 million feet--in the aggregate, 72 million feet.

Comparison of current annual growth with potential annual growth shows the board-foot current growth to equal 74 percent of potential growth but the cubic-foot current rate to be only 49 percent of the potential rate. The more favorable ratio in the case of board-foot rates is due to the preponderance of large second growth in the growing stock.

The Forest Situation Summarized

Currently a little more than half of the 587,000 acres of forest land in Lincoln County is stocked with conifer saw timber whose total volume is 11.2 billion board feet. However, only 36 percent of the saw-timber acreage and 59 percent of the volume is old-growth timber ready for harvest.

In addition to some 196,000 acres of immature conifer saw timber, chiefly 70 to 90 years old and growing at a rapid rate, there is 157,000 acres of immature conifer timber of seedling, sapling, and pole size--in the aggregate 353,000 acres of growing stock on forest lands of high productive capacity.

Although pure hardwood stands cover but 29,000 acres, red alder, the principal hardwood species, is an associate in immature conifer stands on 249,000 acres. The species has been of particular importance in the county in reclaiming large acreages of land deforested by fire, through site improvement and as a nurse crop for conifers.

Idle forest lands total 56,000 acres of which one-fourth is nonre-stocked cut-over land and three-fourths is deforested burn. These lands constitute one of the more serious forest problems in the county; the deforested status is of long standing, and because of heavy bracken fern cover and high fire hazard, natural regeneration will be very slow and highly improbable.

Recent cut-over areas, cut since 1930 and totaling 32,000 acres, need not become a problem of idle land if given complete fire protection.

Under the impetus of national-defense and war-emergency lumber markets, the rate of forest utilization has increased materially in the past few years. Sawlog production reached 316 million board feet in 1942, an all-time high, and average annual cut of sawlogs and minor products during the 3-year period 1940-42 was 277 million board feet.

Fortunately, the vast bulk of the cutting drain has been of old-growth timber; to date, cutting of immature stands has been relatively light.

Half of the forest land in the county is privately owned; although 47 percent of the saw-timber acreage and 53 percent of the timber volume is privately held, 85 percent of the acreage and 89 percent of the volume of old-growth Douglas-fir, the major species, is so held. A large acreage of private land has passed to county ownership through tax foreclosure; part of this acreage has been transferred to the State of Oregon, but the county currently owns 69,000 acres of forest land. Lands in Federal ownership, largely national forest, include a third of the forest land and contain two-fifths of the timber volume. Federal lands are very largely stocked with immature timber.

The present complexity of the forest-land ownership--intermingling of all classes of ownership throughout most of the county to an unusual degree--creates a serious problem of stabilizing ownership and obtaining efficient forest management. The blocking-up of private holdings as tree farms, transfer of county lands to stable ownership, and consolidation of public lands into workable units should prove helpful.

The large acreage of thriftily growing stands on productive sites results in a current annual net growth of 212 million board feet--about 80 percent of the calculated potential growth capacity and 77 percent of average current annual drain through cutting.

Because of inadequate deep-water and rail transportation, expansion of the sawmilling and allied industries has not kept pace with growth in logging operations and currently about two-fifths of the volume of logs produced is exported to plants in neighboring counties. Further development of forest industries should come through establishment of permanent manufacturing units of a capacity commensurate with timber volumes obtainable under sustained-yield management.

Although analysis of the data obtained in the forest survey has disclosed both favorable and unfavorable aspects, the former so outweigh the latter that it seems reasonable to predict that the industry of growing forest crops and utilizing them will always predominate in the economy of Lincoln County.